WELLS + ASSOCIATES

MEMORANDUM

TO: Louis M. Mosurak, AICP
Loudoun County Office of Transportation Services

CC: Roy Barnett
Van Metre Companies

Jeff Nein
Cooley Godward LLP

FROM: Michael J. Workosky, PTP, TOPS
James W. Watson, PTP

DATE: October 23, 2009

SUBJECT: Tall Cedars Parkway/Stone Springs Boulevard
Traffic Signal Threshold Study;
Loudoun County, Virginia

INTRODUCTION

This document summarizes a traffic signal threshold study for the Tall Cedars Parkway/Stone Springs Boulevard intersection in Stone Ridge. The intent of the study was to identify the number of residential units that could be constructed and occupied prior to warrants for signalization being met at the intersection in conjunction with the revised proffer statement for the Stone Ridge Commercial development application.

The analyses conclude that approximately 2,530 residential units of the total approved 3,265 units could be occupied prior to exceeding level of service thresholds or meeting critical traffic signal warrants at the Tall Cedars Parkway/Stone Springs Boulevard intersection, as outlined below.

BACKGROUND DATA AND TRAFFIC FORECASTS

This constraint study is based on the Stone Ridge Commercial Revised Traffic Impact Study, prepared by Wells + Associates, Inc. dated June 16, 2009. The traffic forecasts developed through the preparation of this study were used as a baseline condition for this constraint analysis. The future traffic volume forecasts assumed a horizon year of 2015, and full buildout and occupancy of all the commercial space within the site.

Iterative traffic forecasts for the Tall Cedars Parkway/Stone Springs Boulevard intersection were prepared with various levels of residential development. These volumes were then analyzed from a level of service perspective (as an all-way stop condition) and the resulting Average Daily Traffic (ADT) was used to evaluate the traffic signal warrants. A copy of the traffic volume forecasts, lane use, and levels of service are shown on Figure 1.

LEVELS OF SERVICE AND SIGNAL WARRANT ANALYSIS

The peak hour and daily traffic forecasts were analyzed to determine the level of service and anticipated traffic signal warrants at the Tall Cedars Parkway/Stone Springs Boulevard intersection. The intersection operates as an all-way stop condition and is expected to continue to operate in this manner in the future.

The traffic forecasts that include all of the commercial space and 2,530 residential units were analyzed with the results and are contained in the Appendix. All of the intersection approaches are expected to operate at acceptable levels of service (LOS) "D" or better during both the AM and PM peak periods.

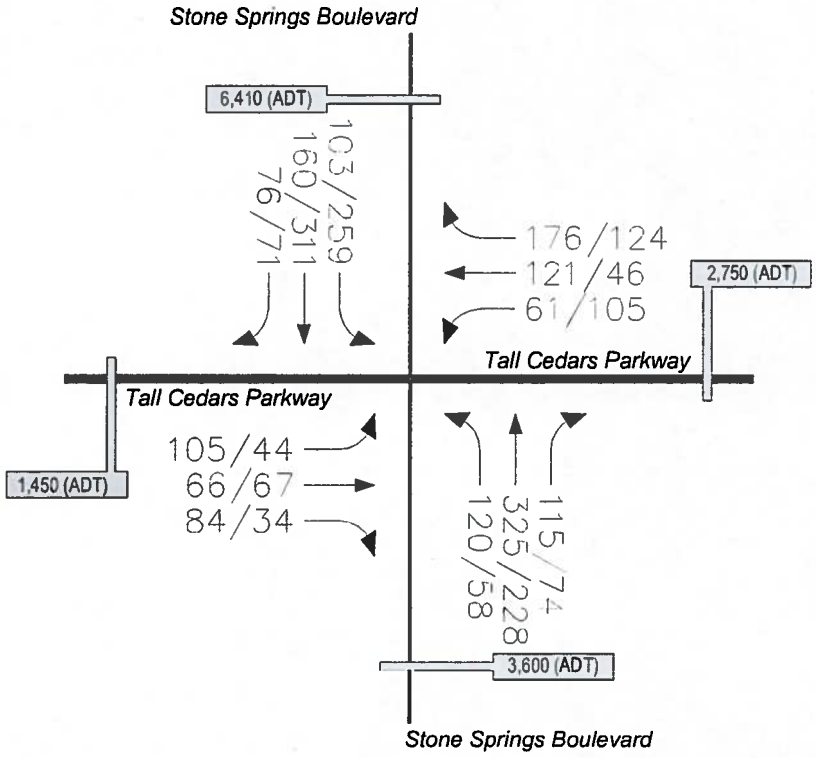
The average daily traffic volumes were evaluated in accordance with Virginia Department of Transportation standards with the results contained in the Appendix. The results indicate that only Warrant 1A (Minimum Vehicular Volume) would be met under future conditions assuming all of the commercial space and up to 2,530 residential units of the 3,265 units is built and occupied. Satisfaction of this warrant only does not generally constitute the need for a traffic signal.

CONCLUSION

The results of the threshold analysis conclude that in addition to buildout of the commercial development space, approximately 2,530 residential units of the total approved 3,265 units could be built and occupied while allowing for adequate levels of service and prior to meeting critical traffic signal warrants at the Tall Cedars Parkway/Stone Springs Boulevard intersection. Thus, the revised proffer statement that includes this threshold is adequate.

Questions regarding this document should be directed to Wells + Associates.

2015 Future Peak Hour Traffic Forecasts and Average Daily Trips (ADT)



2015 Lane Use and Traffic Control and Levels of Service (LOS)

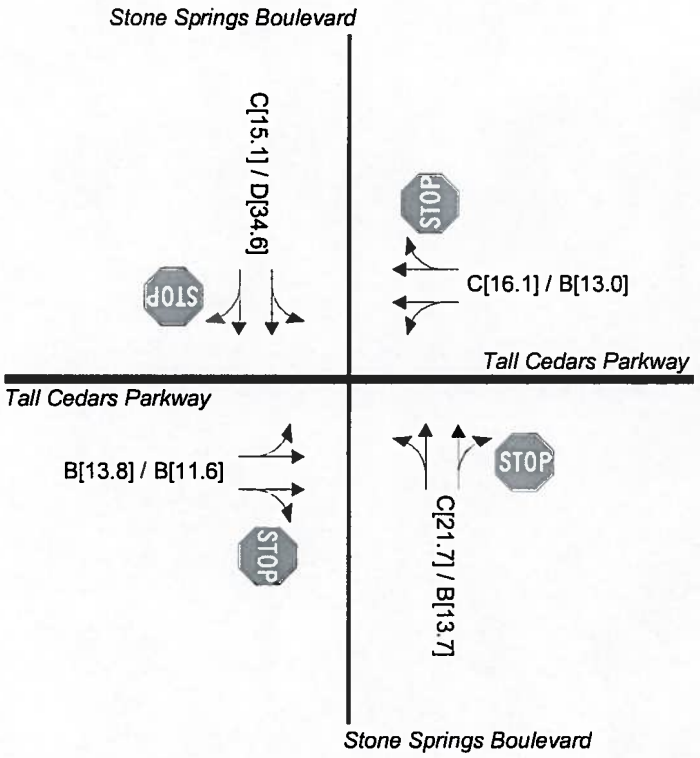
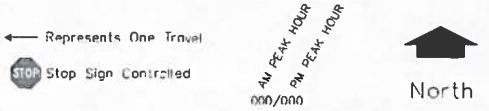


Figure 1
2015 Traffic Forecasts, Lane Use and Traffic Control and Levels of Service



Stone Ridge Commercial
Loudoun County, Virginia

Wells + Associates, Inc.

Appendix

Table 1
Stone Ridge Commercial
Stone Ridge Trip Generation Summary-Proposed Program (1, 2)

Land Use	ITE Land Use Code		Amount	Units	AM Peak Hour IN	AM Peak Hour OUT	AM Peak Hour TOTAL	PM Peak Hour IN	PM Peak Hour OUT	PM Peak Hour TOTAL	Average Daily Traffic (3)
Residential											
Single-Family Detached	210		626	DU	112	336	448	352	207	559	6,260
Townhouse/Condominium	230		1,234	DU	66	319	385	316	156	472	10,736
Multi-Family	220		671	DU	67	266	333	251	135	387	4,183
Residential Subtotal			2,531	DU	245	921	1,166	919	498	1,418	21,179
Reduction for TDM (AM/PM) (4)	10%	10%			-	92	92	92	-	92	184
Internal to Office (AM/PM)	4%	8%			10	37	47	74	40	113	1,694
Internal to Retail (AM/PM)	1%	13%			6	9	15	99	91	190	2,043
Internal to Middle School	15%	3%			81	99	180	22	24	45	486
Internal to Elementary School	11%	0%			58	70	128	-	-	-	452
Internal to Library	0.2%	1%			1	2	2	6	6	12	95
Internal to Rec Center (North)	1%	1%			3	5	8	6	2	8	114
Internal to Rec Center (South)	0%	0%			1	2	3	2	1	3	46
Internal to Church	0%	0%			1	1	2	1	1	2	23
Internal to Day Care	2%	2%			12	14	26	14	12	26	159
Net New Residential Trips					73	591	664	604	322	926	15,884
Employment											
General Office	710		385,332	S.F.	486	66	552	87	424	510	3,769
General Industrial (Industrial Park)	130		142,904	S.F.							
General Industrial (Industrial Park)	130		319,170	S.F.							
General Industrial (Industrial Park) Total			462,074	S.F.	275	60	335	84	314	398	3,040
Employment Subtotal			847,406	S.F.	761	126	887	171	738	908	6,809
Reduction for TDM (AM/PM) (4)	10%	10%			76	-	76	-	74	74	150
Internal to Residential (AM/PM)	5%	12%			37	10	47	40	74	113	850
Internal to Retail (AM/PM)	1%	6%			6	9	15	66	61	127	409
Internal to Day Care (AM/PM)	3%	3%			12	14	26	14	12	26	159
Net New Employment Trips					630	94	724	51	517	568	5,242
Retail											
Retail	820		291,705	G.S.F.	181	116	298	609	660	1,269	13,619
New Trips	80%	75%			136	87	223	365	396	761	8,171
Pass-by (AM/PM) (5)	15%	15%			27	17	45	91	99	190	2,043
Internal to Residential (AM/PM) (6)	5%	15%			9	6	15	91	99	190	2,043
Internal to Office (AM/PM) (6)	5%	10%			9	6	15	61	66	127	1,362
School											
Middle School	522		1,200	Students	396	324	720	94	86	180	1,944
Internal from Residential (AM/PM) (7)	25%	25%			99	81	180	24	22	45	486
Net New Middle School Trips					297	243	540	71	65	135	1,458
Elementary School	520		700	Students	140	115	255	-	-	-	903
Internal from Residential (AM/PM)	50%	50%			70	58	128	-	-	-	452
Net New Elementary School Trips					70	58	128	-	-	-	452
Ancillary Uses											
Library	590		40,000	S.F.	34	13	47	115	125	240	1,898
Internal from Residential (AM/PM)	5%	5%			2	1	2	6	6	12	95
Net New Library Trips					32	12	45	109	119	228	1,803
Recreation Center (North)	495		5,000	S.F.	5	3	8	2	6	8	114
Internal from Residential (AM/PM) (8)	100%	100%			5	3	8	2	6	8	114
Net New Rec Center Trips					-	-	-	-	-	-	-
Recreation Center (South)	495		2,000	S.F.	2	1	3	1	2	3	46
Internal from Residential (AM/PM) (8)	100%	100%			2	1	3	1	2	3	46
Net New Rec Center Trips					-	-	-	-	-	-	-
Church	560		50,000	S.F.	19	17	36	17	16	33	456
Internal from Residential (AM/PM) (8)	5%	5%			1	1	2	1	1	2	23
Net New Church Trips					18	16	34	16	15	31	433
Day Care	565		6,000	S.F.	54	48	102	50	56	105	634
Internal from Residential (AM/PM) (8)	25%	25%			14	12	26	12	14	26	159
Internal from Office (AM/PM) (8)	25%	25%			14	12	26	12	14	26	159
Net New Day Care Trips					27	24	51	25	28	53	317
County Park	412		25	Acres	-	0	0	1	1	2	58
Internal from Residential (AM/PM) (8)	0%	0%			-	-	-	-	-	-	-
Net New Rec Center Trips					-	0	0	1	1	2	58
Total Approved Site Trip Generation					1,284	1,125	2,408	1,243	1,461	2,961	33,817

Notes: (1) Trip generation based on Institute of Transportation Engineers Trip Generation, 7th Edition.
(2) Development densities based on site plans provided by Urban Engineering.
(3) Average Daily Traffic for SFDU 10/D.U. and SFA of 8.7/D.U. based on County rate.
(4) Transportation Systems Management (TSM) reduction applied to peak hour, peak direction trips as assumed in original 1995 and August 2005 traffic studies.
(5) Pass-by rate utilized by VDOT and assumed in original 1995 and August 2005 traffic studies.
(6) Rate based on original June 1995 traffic study.
(7) Rate based on information provided by Loudoun County Public Schools.
(8) Rate based on information provided by Van Metre Companies.

Table 1
Tall Cedars Parkway/Stone Springs Boulevard
Stone Ridge Commercial ADT Signal Warrant Study
Warrants 1A, 1B, 1C

	Stone Springs Boulevard			Tall Cedars Parkway			
	Projected ADT	Min. Required EADT*	Satisfied	Projected ADT	Min. Required EADT *	Satisfied	Warrant Satisfied
Tall Cedars Parkway/Stone Springs Boulevard							
Warrant 1A - Minimum Vehicular Volume	10,010	9,600	Yes	4,200	3,200	Yes	Yes
Warrant 1B - Interruption of Continuos Traffic	10,010	14,400	No	4,200	1,600	Yes	No
Warrant 1C - Combination 80%	10,010	7,680	Yes	4,200	2,560	Yes	No
	10,010	11,520	No	4,200	1,280	Yes	

Source: Institute of Traffic Engineers, Manual of Traffic Signal Design, 2nd Edition (Numbers revised by VDOT/NOVA policy)

Notes: * Minimum Required EADT is based on number of approach lanes.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	105	66	84	61	121	176	120	325	115	103	160	76
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	117	73	93	68	134	196	133	361	128	114	178	84

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	153	130	135	263	314	308	203	173
Volume Left (vph)	117	0	68	0	133	0	114	0
Volume Right (vph)	0	93	0	196	0	128	0	84
Hadj (s)	0.41	-0.47	0.29	-0.49	0.25	-0.26	0.32	-0.31
Departure Headway (s)	8.5	7.6	8.2	7.4	7.7	7.2	8.1	7.5
Degree Utilization, x	0.36	0.28	0.31	0.54	0.67	0.61	0.46	0.36
Capacity (veh/h)	404	448	422	462	456	484	429	462
Control Delay (s)	15.0	12.3	13.5	17.5	23.6	19.7	16.6	13.4
Approach Delay (s)	13.8		16.1		21.7		15.1	
Approach LOS	B		C		C		C	

Intersection Summary				
Delay	17.6			
HCM Level of Service	C			
Intersection Capacity Utilization	57.7%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	44	67	34	105	46	124	58	228	74	259	311	71
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	49	74	38	117	51	138	64	253	82	288	346	79

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	86	75	142	163	191	209	461	252
Volume Left (vph)	49	0	117	0	64	0	288	0
Volume Right (vph)	0	38	0	138	0	82	0	79
Hadj (s)	0.32	-0.32	0.44	-0.56	0.20	-0.24	0.35	-0.19
Departure Headway (s)	8.3	7.7	8.1	7.1	7.4	7.0	7.1	6.6
Degree Utilization, x	0.20	0.16	0.32	0.32	0.39	0.40	0.91	0.46
Capacity (veh/h)	414	445	426	484	470	499	461	534
Control Delay (s)	12.2	10.9	13.7	12.3	13.9	13.4	45.9	13.8
Approach Delay (s)	11.6		13.0		13.7		34.6	
Approach LOS	B		B		B		D	

Intersection Summary			
Delay	22.7		
HCM Level of Service	C		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		